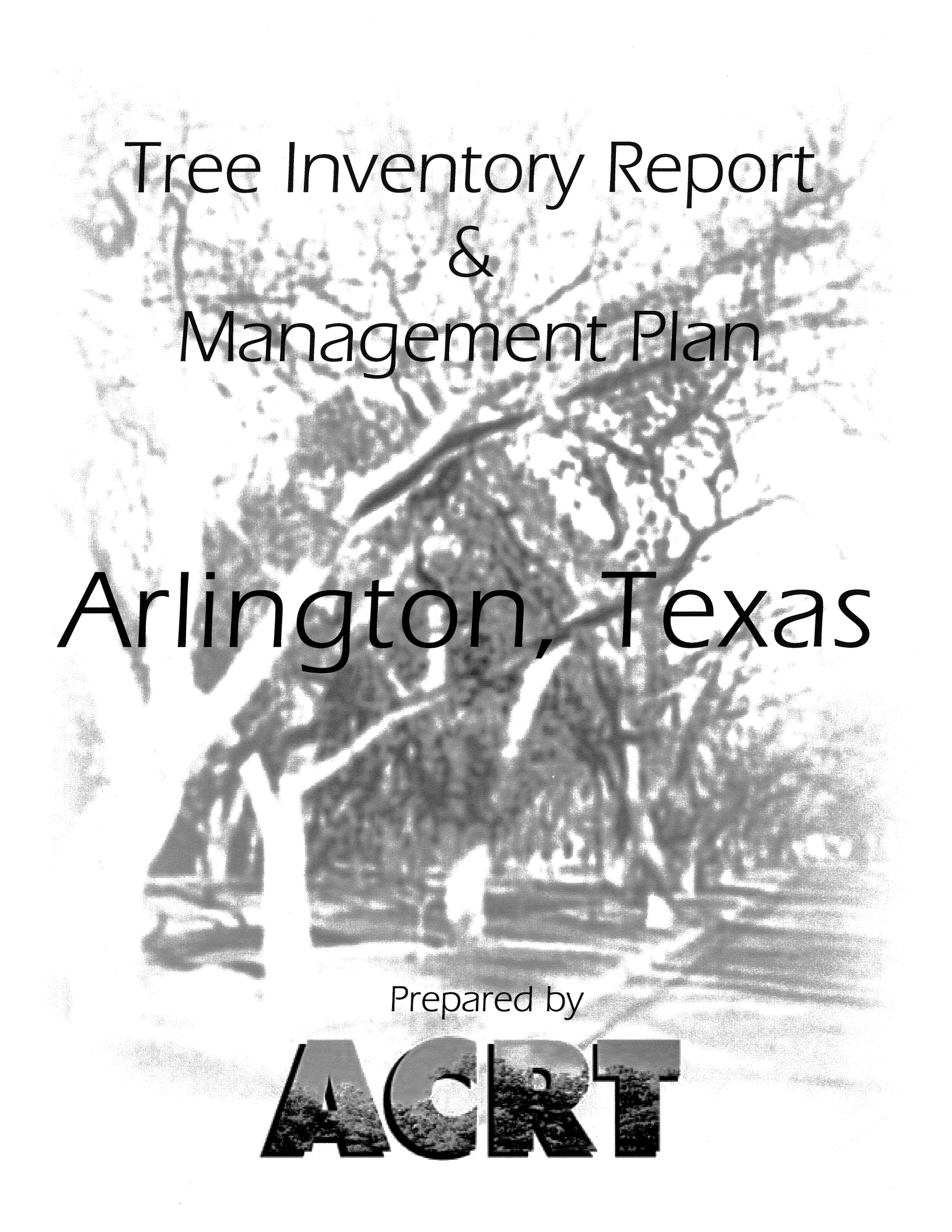
Tree Inventory Report
&
Management Plan

Arlington, Texas



Prepared by

ACRT

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City of Arlington

Elzie Odom ..... Mayor
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Stacy Catalani ..... City Forester

ACRT, Inc.

Brandon Lassiter ..... *Urban Forester*
Alan Moore ..... *Urban Forester*
Kevin Puls ..... *Administrative Manager, Urban Forestry*
Ed Sargent ..... *Vice President, Urban Forestry*
Kevin Heatley ..... Senior Forester
Mark Schleappi ..... *Computer Programmer/Technical Support*
Cathy Godfrey ..... *CAD/GIS Coordinator*

Executive Summary

Recognizing that the forest canopy is an important and valuable part of its infrastructure, the City of Arlington contracted with ACRT to update and extend the scope of its inventory data. The goal of the assessment was to create a current baseline of information, identify trends, and establish maintenance needs associated with the public tree resource.

This plan summarizes the findings of the street and median tree inventory performed in January and February of 2003 by ACRT staff and makes recommendations as to the protection and enhancement the Arlington tree cover. The following is a summary of the results:

- ACRT inventoried a total of 5,536 trees and stumps on Arlington's streets and medians.

- Seventy-three species and varieties of trees were recorded on street rights-of-way. This represents a 23% increase in the level of species diversity originally determined during the 2000 assessment. Cedar and Lacebark Elms are the leading species in terms of total tree number. Species diversity was high, with no single species exceeding 9% of the total population.

- Small and medium size trees comprise the bulk of the Arlington publicly maintained tree population (median and street). Approximately 77 percent of the trees are in the 1 to 6-inch diameter class, along with 14 percent in the 7 to 12-inch size class. Only 2.5% of trees inventoried exceeded 19 inches in diameter.

- The majority (55.7 percent) of Arlington's median/street tree population was evaluated to be in good condition and 29.8 percent in fair condition.

- As a direct result of proactive management, Arlington demonstrates a surprisingly low number of hazardous conditions, only 159 trees were recommended for removal and 120 trees for priority pruning.

- The City has made substantial headway in reducing the backlog of young plants requiring pruning to train for proper structure.

Arlington is fortunate to possess a diverse municipal tree collection in good condition, without a backlog of major differed maintenance. This enables the forestry program to continue to invest in proactive management. Proactive management will provide the residents with the greatest marginal rate of return from their investment in the "Green Infrastructure".

Introduction

The tree canopy is an important component of the publicly owned infrastructure in the City of Arlington. As opposed to most of the "gray infrastructure" such as buildings, roads, sewers, and sidewalks, the tree population, or "green infrastructure" value actually appreciates over time. Most of the well-publicized benefits associated with tree cover (micro-climatic temperature regulation, air and water quality enhancement, carbon sequestration) increase with forest age and size. However, the potential exists for this asset to become a liability if structural and health concerns are not addressed in a consistent and timely manner. Both the resource assessment performed by ACRT, and the TreeManager database employed by the City of Arlington, are critical components of protecting this resource and the safety of the general public.

Urban forests offer a variety of benefits to their communities including:

- Solar radiation interception
- Micro-climate regulation
- Noise Reduction
- Improved air quality
- Reduced stormwater runoff
- Enhanced economic activity
- Carbon Sequestration

Maximizing these tree benefits, and minimizing liability exposure, requires a proactive approach to maintenance. Identification and remediation of potential problems, as identified in this inventory, before they reach a crisis situation is a more cost-effective solution than reactive management. Removing declining vegetation and branches prior to failure will enable the City to realize cost efficiencies inherent in scheduled work. As a simple example; productive "saw-time" can be maximized if work is geographically clustered – an impossibility if work location is determined in reaction to service calls alone.

Identification of hazards and the protection of public safety should be the primary focus of any urban forestry program. The City of Arlington has demonstrated its commitment to this goal through the development and enhancement of its tree inventory and database.

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Inventory Methodology and Results

A. Inventory

ACRT personnel inventoried Arlington's street and median trees during January and February of 2003. The inventory identified 5,071 trees and 465 tree stumps.

B. Location Information

Trees were located by street and address along street rights-of-way. Addresses were recorded in the field from a listing provided by the City. If the tree is located on a parcel without a known address, an address was assigned based on the series of addresses of adjacent properties. Tree numbers distinguish between multiple sites on a single property (Figure 1), and all sites are located by block side information (Figure 2). In most cases the street right-of-way corresponds to the fence behind the sidewalk. Naturally-growing trees 2 inches in diameter or greater were included in the inventory.

New trees added to the inventory were mapped using Global Positioning System (GPS) technology. A Trimble backpack unit provided approximately sub-meter accuracy. Spatial data was subject to both real-time and post-processing correction. Where satellite reception was unavailable, trees were entered digitally into the spatial database. The coordinate system was based on NAD83 and North Central Texas State Plane. Map units are in feet. Each tree was provided with a unique identifying number that also corresponds the embossed tag number attached to the plant.

The "Theme" category in the listings (generated by Tree Manager™) indicates whether the site is on the street right-of-way or median. Additonal themes have been added to the database for future inventory characterization.

GPS Equipment

Figure 1. Tree number methodology.

Trees are numbered sequentially in the order of ascending addresses. There is a separate series of numbers for each side of the property. Trees on the side of the property are indicated by an "S", at the rear by an "R", on a median by an "M", and in a one-tree size island by an "I" as shown in the drawing. The trees at the rear of the property are located next to the road.

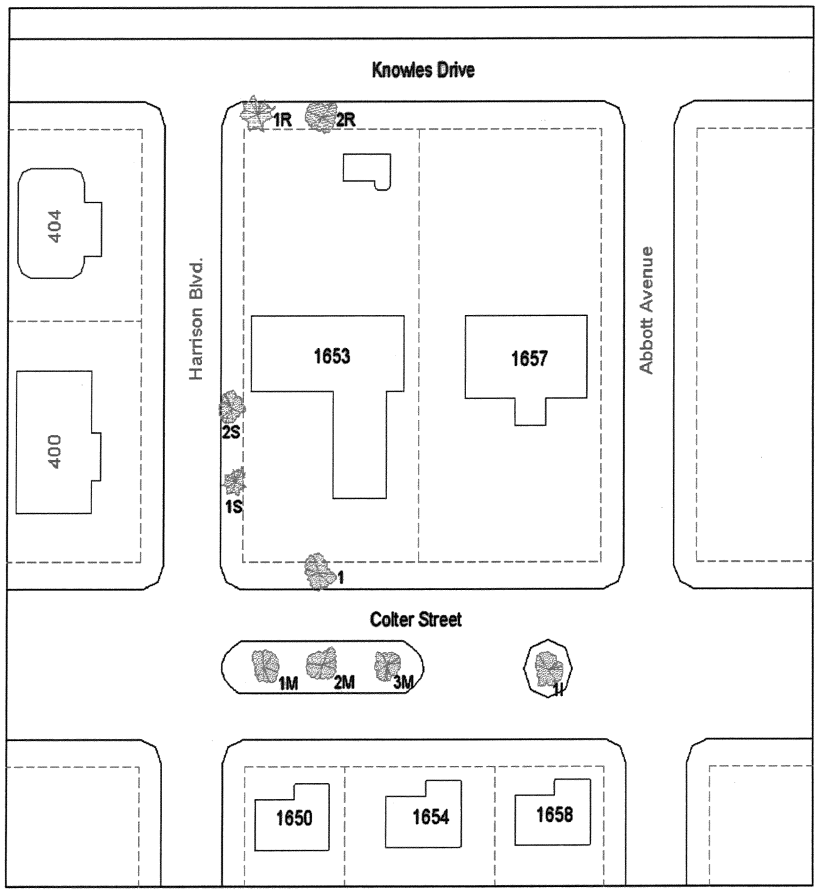
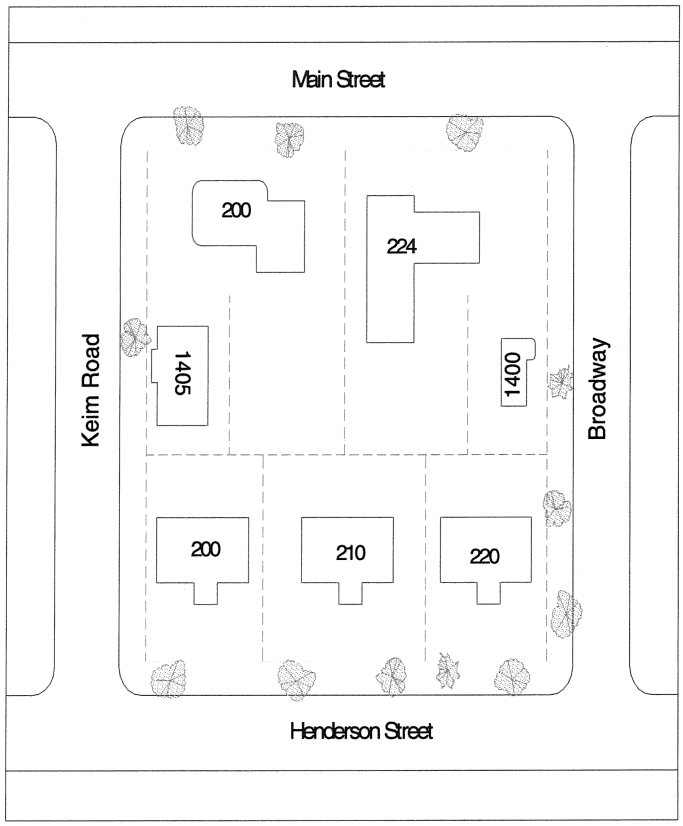


Figure 2. Block side methodology.

Below is a drawing that illustrates the use of block side information. In the drawing, the shaded areas with a number in them represent trees. Boxes with an address in them represent buildings. Four streets are also represented in the drawing: Keim Road, Broadway, Main Street and Henderson Street.



Block Side: A segment of street located between two cross streets.

C. Tree Information

1. Species Composition and Diversity

Trees were identified and recorded by genus and species, and by cultivar when appropriate. Both the common name and scientific (Latin) name were recorded.

As tree species vary considerably in life expectancy and maintenance requirements, it is essential to know the species composition of the urban forest. The number and condition of each species group influences maintenance and planting activities. Species diversity is a major objective of urban forest management. A diverse tree population reduces the percentage of the urban forest resource that could be lost to a species-specific pest or disease. For example an over reliance on the Genus *Quercus* could place a tree population at risk for catastrophic loss from Oak Wilt disease. In addition to lowering this risk, it is important to match the proper tree species to the conditions of each site. Different species and cultivars offer predictable mature heights and crown shapes, allowing flexibility in selecting the right tree for the right space. From the perspective of landscape architecture, a diverse tree population is more interesting. With proper planning, a landscape can exhibit flowering trees in season, shade tress of varying density in summer, drought-resistant trees in the dry seasons, and hearty trees that resist damage from cold winter temperatures.

Appropriate vegetation selection can reduce the homogenization of the American landscape & help define a region.

Creating a "sense of place" is also an important goal of species diversification. The use of native species indigenous to an area helps to create a sense of identity as important as the local cuisine or architecture. Appropriate vegetation selection can reduce the homogenization of the American landscape and help define a region. Sugar Maples in New England, Dogwoods in Tennessee, and Magnolias in Georgia are excellent examples of trees binding people to a region.

The City of Arlington has made strong strides in diversifying its public tree collection. In the space of two years total species diversity has increased an amazing 23%! Afghan Pine, which was approaching close to 10% of the total tree composition in 2000, has dropped to 7.6% of the population. Improved species selection, coupled with a proactive planting program, has reduced the City of Arlington's exposure to epidemics and the financial and ecological strain associated with catastrophic loss.

In order to minimize the risk of species or genus-specific pathogen activity, ACRT advises the City of Arlington to avoid allowing any species to exceed 10%, and any genera 20%, of the total population. As such, the City may wish to reduce Elm plantings, as this genera now comprises 19.4% of the tree cover.

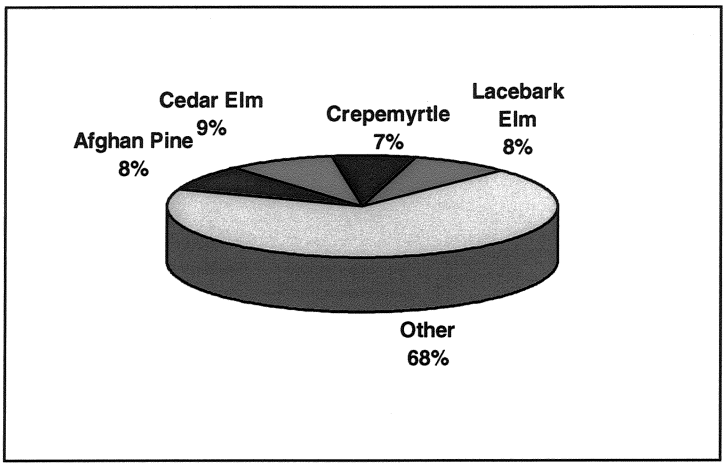


Figure 3: 2003 Species Diversity

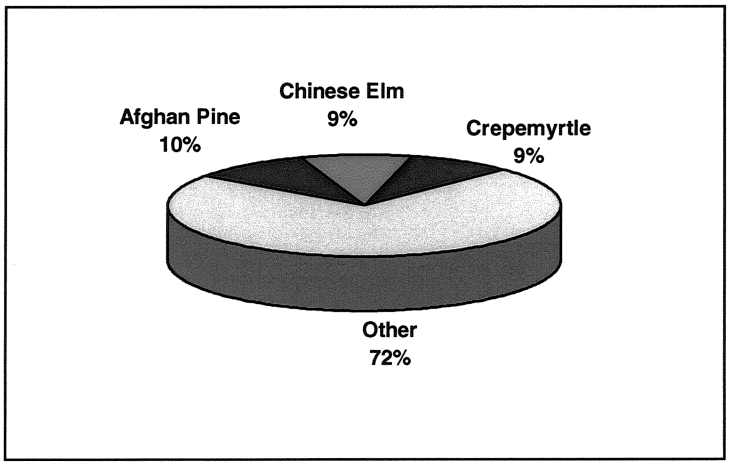


Figure 4: 2000 Species Diversity

Table 1. Overview of species diversity for inventoried Street/Median trees.

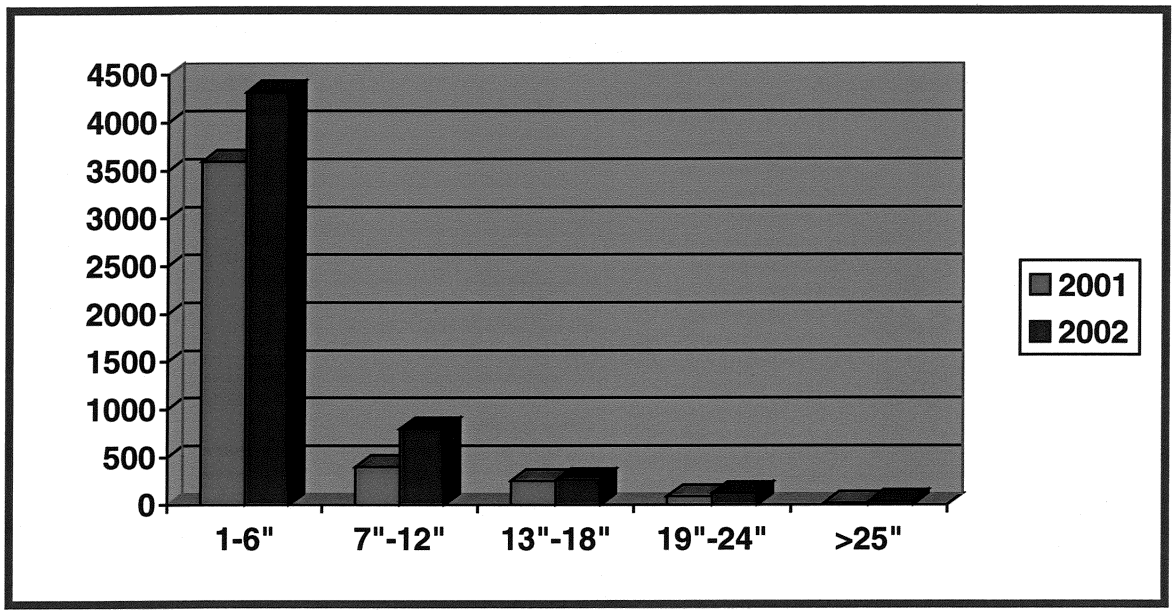
Common Name	Trees	% of Total Inventory
CEDAR ELM	479	8.6
LACEBARK ELM	469	8.5
AFGHAN PINE	425	7.7
CREPEMYRTLE	379	6.8
CHINESE PISTACHE	373	6.7
EASTERN REDBUD	328	5.9
SHUMARD OAK	290	5.2
STUMPS (species unknown)	280	5
LIVE OAK	272	4.9
BALDCYPRESS	238	4.3
CALLERY PEAR	202	3.6
YAUPON HOLLY	184	3.3
ALL OTHER SPECIES	1617	29.5
Totals	**5536**	**100**

2. Size Class Distribution

Diameter at breast height (DBH) is the standard urban forestry tree measurement. The DBH was recorded for all trees to the nearest inch. On trees that fork below 54 inches, the diameter was measured at the narrowest point of the trunk above the root flare. When trees fork at 54 inches, the diameter was measured just below the fork. Trees that had more than one stem were measured for the average diameter of one of the stems, then recorded as multiple stems in the "Notes" box. For the purpose of data analysis, trees were placed in the following diameter classes: 1-6 inches, 7-12 inches, 13-18 inches, 19-24 inches, and 25-30 inches.

The size class comparison and distribution of inventoried trees in Arlington is summarized by DBH in the following graph. Although there has been some increase in tree size, Arlington's tree population contains mostly young trees. The City has sufficient growing stock in the young age class. ***Planting should continue to be emphasized however, both to address the 8% of the locations occupied by stumps and to compensate for mortality.***

Figure 5: Size Class Comparison



Trees 6 inches DBH and smaller currently comprise 77 percent of the median/street tree population. A sizable number of plants have advanced over the last three years into the 7 - 12 inch bucket grouping. During 2000, 9.2 percent of the population fell into this category. As of Winter 2003, this size class accounted for 19.3 percent of the population.

The large number of small trees continues to speak well for the future of Arlington's developing urban forest. These small trees are growing vigorously in general, and are at a stage where maintenance costs are quite low. Proper maintenance now will yield great dividends in the future when they reach maturity and are providing maximum benefits. Routine maintenance program at this stage will reduce future maintenance costs by developing strong structure thus avoiding the formation of potential hazards.

3. Tree Maintenance Needs

Each tree was placed in one maintenance category (Figure 5). Field judgments were made from the ground based on visual observation and hazard estimation. Definitions of the maintenance categories follow.

a) *Removal One* – Trees designated as immediate removals are dead or have one or more defects that cannot be cost-effectively remedied. The majority of trees in this category have a large percentage of dead crown and are potential safety hazards. Large dead and dying trees that are high liability risks are included in this category. There were a total of 57 trees prescribed as Removal One in the inventory.

b) *Removal Two* - Trees that should be removed, but that pose minimal liability to persons or property will be identified in this category (example: transplant failure, amenity removal). In the entire inventory, 102 of such trees were recommended for removal.

c) *Priority One Prune:* Trees recommended for priority one pruning are recommended for trimming to remove hazardous deadwood, hangers or broken branches. These trees have broken or hanging limbs, hazardous deadwood and dead, dying or diseased limbs or leaders greater than 4 inches in diameter. Priority one prune was recommended for 20 trees.

d) *Priority Two Prune:* These trees have dead, dying, diseased or weakened branches between 2 and 4 inches in diameter and are potential for safety hazards. Priority two prune was prescribed for 100 trees.

e) *Routine Large Prune*: These trees require routine horticultural pruning to correct structural problems or growth patterns that would eventually obstruct traffic or interfere with utility wires or buildings. Trees in this category are large enough to require bucket truck access or manual climbing. Routine pruning was prescribed for 713 large trees.

f) *Routine Small Prune*: These trees require routine horticultural pruning to correct structural problems or growth patterns that would eventually obstruct traffic or interfere with utility wires or buildings. These trees are small-growing, or immature trees that can be pruned from the ground. Routine pruning was prescribed for 3945 small trees.

g) *Re-inspect*: Trees that currently do not exhibit hazardous conditions but are in some way damaged, stressed, or in the initial stages of disease that increases the likelihood of developing hazardous conditions in the near future.

Examples of such trees include those damaged by mechanized equipment, tree roots exposed by street reconstruction, trees that have been excessively topped, and trees that have small cavities without excessive rot. Trees identified as needing re-inspection should be inspected annually until the tree recovers, corrective maintenance is performed or the tree is removed. Twenty-five trees are in need of re-inspection.

h) *Train*: Young trees that have the potential of becoming large trees must be pruned to correct or eliminate weak, interfering or objectionable branches in order to minimize future maintenance requirements. These trees, up to 20 feet in height, can be pruned with a pole pruner by a person standing on the ground. Pruning to train was prescribed for 109 trees.

i) *Stump*: This category indicates a stump that should be removed; Four hundred sixty-five stumps were inventoried. This will also create additional planting sites.

The causes for tree decline and death may be biogenic (non-human) or anthropogenic (human) induced. Biogenic causes include disease, insects, drought, maturity and frost. Anthropogenic causes include physical injury due to vehicles or equipment, vandalism, poisoning and root disturbance. Three main reasons unhealthy trees should be removed include reducing potential for injury to people and property, eliminating breeding sites for insects and diseases, and maintaining aesthetic quality.

All trees recommended for removal one should be inspected and scheduled for removal as soon as possible. Listings of inventoried trees recommended for removal can be generated in TreeManager for Windows.

Trees recommended for priority pruning for safety are prioritized based upon the size and location of the dead, broken or hanging branches and on the amount and type of adjacent traffic and targets. These trees are in various stages of decline and the larger ones could potentially cause personal injury or property damage. Listings of all inventoried trees recommended for priority pruning can also be generated In TreeManager.

As observed from the ground, trees recommended for routine large pruning and routine small pruning do not have any major dead wood or excessive decay problems. Trees in the routine large category require a bucket truck or an arborist capable of climbing trees to reach the limbs for pruning. Trees in the routine small category are generally mature and small enough to be pruned from the ground with hand tools. Establishment of a six-year pruning cycle will adequately maintain these trees.

Young trees need to be pruned as soon as possible to ensure structural integrity and desirable growth patterns. While the relative percentages of most of

the different work types have remained unchanged since 2000, it is obvious that the City has made major inroads into reducing the backlog of new plants requiring training. This investment will yield high dividends as these plants mature and develop appropriate structural elements.

Stumps should be removed as soon as practical. Stumps are not aesthetically pleasing and new trees often cannot be planted at the site until the stumps are removed. Stumps pose a potential liability to the City from residents falling over them, and can cause expensive damage to lawn maintenance equipment.

Arlington is fortunate to possess a system to irrigate the median trees. As evidenced by the extreme drought currently afflicting the region, maintaining adequate soil moisture through irrigation and proper mulching is critical to tree survival.

Table 2. Maintenance needs by size class for median and street trees (2003).

Maintenance Category	DBH in inches					Totals
	0-6	7-12	13-18	19-24	>25	
Removal, Priority 1	30	11	8	2	6	57
Removal, Priority 2	96	5	1	0	0	102
Prune, Priority 1	2	1	9	6	2	20
Prune, Priority 2	36	20	31	10	3	100
Reinspect	14	2	4	4	1	25
Large Routine Prune	81	336	176	97	23	713
Small Routine Prune	3530	394	21	0	0	3945
Train	107	2	0	0	0	109
Stump Removal	421	27	12	4	1	465
Totals:	**4317**	**798**	**262**	**123**	**36**	**5536**

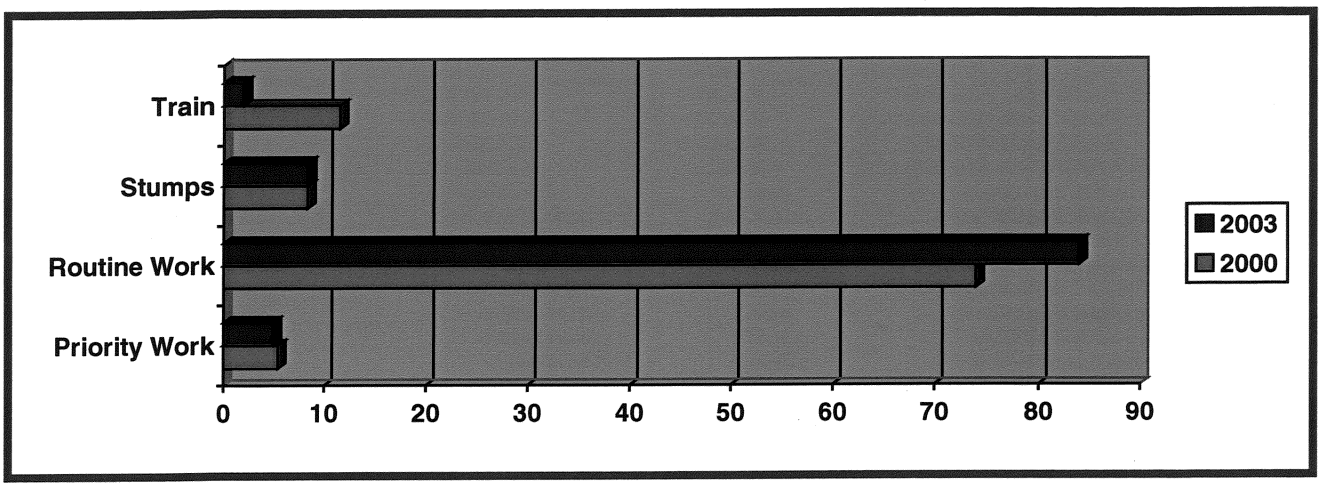
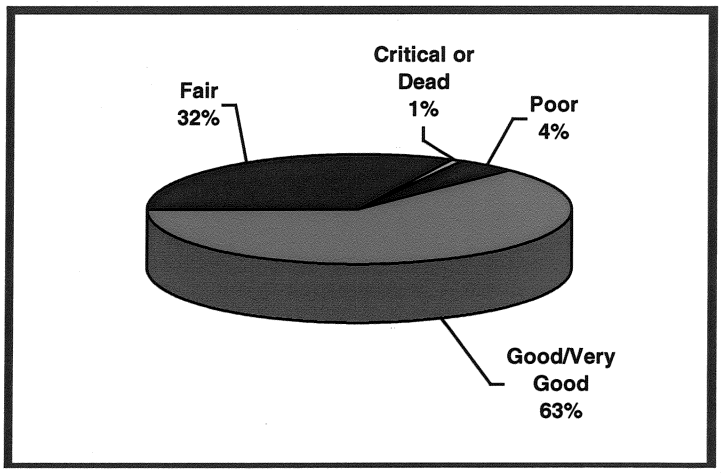


Figure 6: Work Type as a Percentage of Maintenance Volume

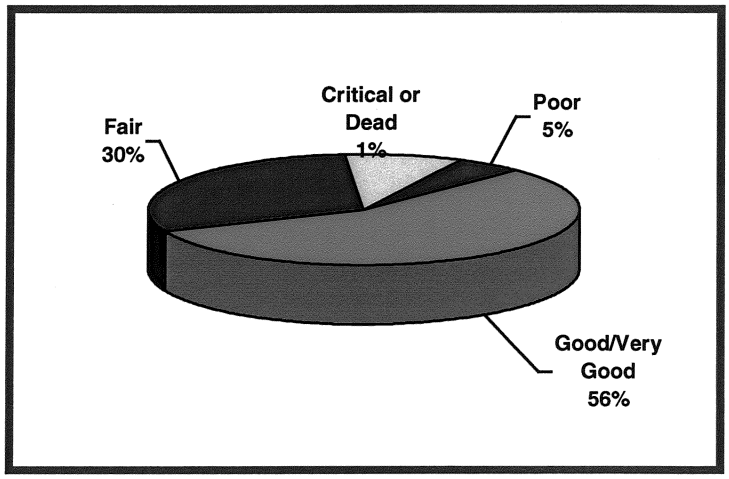
4. Condition

. Figures 7 & 8: Condition summary of street/median trees.

(2000) Top, (2003) Bottom



Condition ratings were determined for the inventoried trees to help assess the overall tree health and to evaluate species performance.. ACRT uses criteria adapted from the International Society of Arboriculture's *Valuation of Landscape Trees, Shrubs, and Other Plants: A Guide to the Methods and Procedures for Appraising Amenity Plants (8th Edition)* as the basis for the field condition rating. At least six different indications of tree condition were examined and rated, including trunk condition, growth rate, structure, insects and diseases, crown development and life expectancy. After a tree was evaluated, it was ranked in one of the following categories: excellent, very good, good, fair, poor, critical and dead.

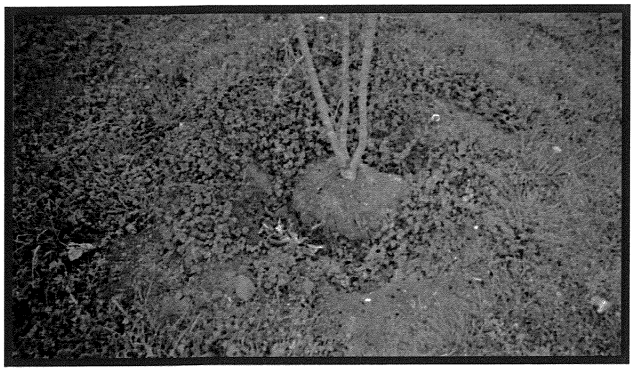


Analysis of the data indicates that there has been a significant increase in the percentage of dead plants recorded during the inventory. This may be an indication of problems associated with the current drought situation. However, comparison with the maintenance data does not indicate a corresponding increase in the percentages of priority removals or stumps. This indicates that the increase is most likely an artifact reflecting differences in the coding of stump conditions. Some stumps may have been recorded as lacking a condition rating in the earlier data set. Overall, condition ratings are favorable for the Arlington community forest, as 86% of the plants are in the fair to very good categories.

5. Root Protection

ACRT continues to emphasize the use of mulch as a root cover to protect the urban forest trees in the City of Arlington. Mulch is extremely beneficial to trees, especially young plants. In addition to moderating fluctuations in soil moisture and temperature, mulch reduces competition from alleopathic turf and helps protect against mower and string trimmer injury. Mechanical damage is still obvious on many of the new plantings in the City. As noted in the inventory, the City of Arlington uses mulch in many cases. ACRT again recommends that organic mulch be used as extensively as possible.

Fortunately, the large medians in Arlington allow for a large mulch area around new trees. A diameter of 5 feet of mulch is recommended for each plant. Mulch depth should be kept under 4 inches and direct contact with the trunk avoided.



A Young Plant Screaming for Mulch

An Old Plant Just Screaming

6. Additional Observations

These observations provide additional information about Arlington's urban forest. Some may pertain to only a small number of trees while other observations look at the City's urban forest as an entire community.

Multi-stem trees: A tree was considered to have multiple stems if more than one stem grew at or near ground level. Multiple stem trees were noted with an "M" followed by the number of stems in the "Notes box." Decisions on whether or not to use trees that have multiple stems by nature should be based on the type of location (particularly what sidewalk, traffic or utility clearance will be required), the desirability of the species and the desired size and shape of the mature trees. Proper training of small trees can reduce or eliminate the incidence of multiple stems.

Staked trees: Trees were noted in the observation category of "Other" if stakes and support ties were present on the tree. Stakes and support ties should only be used to keep a tree upright and then removed after one or two growing seasons. If the stakes and support ties are left on for more than two growing seasons, the tree will become dependent on those supports and not develop its own natural support system. Also, ties left on too long may girdle and kill the tree.

Utility Maintenance: Utility contractors regularly drive on the medians to perform utility maintenance. This can cause various types of damage to median trees. The weight of the vehicles causes soil compaction and thus may cause root damage and restrict root growth. It also appeared as if the utility equipment had made contact with parts of particular trees and caused damage.

Mechanical Damage: Damage caused by lawnmowers, weed-eaters, and vehicles is noted in the category of "Other" if obvious damage was present. The majority of damage was restricted to smaller species of trees such as crepemyrtle and plum. ACRT again recommends mulch as the best defense against this chronic urban tree syndrome.

Insect & Disease Activity: Due to the timing of the data collection during the dormant season, little direct evidence of pathogen activity was visible. ACRT counsels that the City maintain an active vigilance in monitoring for Oak Wilt disease (Ceratocystis fagacearum). This fungus poses a significant threat to the Live Oak component of the Arlington tree population (currently 5%). Early detection, isolation, and removal of infested trees can avoid a minor infestation from escalating into an epidemic.

Urban Forestry Management Plan

A. Urban Forestry Goal

The 2000 Management Plan, prepared by ACRT for the City of Arlington, recommended the following Mission Statement to be adopted as the guiding principle behind the forestry program:

> *The goal of Arlington's Urban Forestry Program is to manage the municipal forest of Arlington in a cost-effective manner by providing to the taxpayers innovative and effective leadership and services aimed at improving the health, composition and structure of the urban forest. The benefits of this program include an improved quality of life for the citizens of Arlington by providing both aesthetic and economic value. The City of Arlington is committed to providing residents with tree planting programs, and with high quality maintenance for existing trees. Arlington's Urban Forestry Program will respond to the needs and expectations of the taxpayers, including public safety and increased value of real estate and trees. The Urban Forestry Program will help to make the city of Arlington a more desirable place to live and work as well as conserve energy and provide carbon sequestering.*

The results of the most recent resource assessment clearly indicate that the City has embraced this strategy over the last three years. Significant improvement has been demonstrated in the number of trees proactively pruned during the early, formative stages of development. This investment will accrue over time and yield substantial benefits in terms of increased tree value and reduced storm damage susceptibility. Total tree number has also increased through an appropriate level of planting designed to offset mortality and vegetate new medians. The City of Arlington should be commended for implementing the recommendations made in 2000.

ACRT is deeply concerned, however, to learn of the impending funding cuts anticipated for the next fiscal year. If the City of Arlington reduces the tree replacement budget to the level indicated (-$70,000), total canopy cover will begin to decline as a result of natural mortality. Investing in and conducting tree planting is a critical component of any urban forestry program. Deferring planting is equivalent to deferring maintenance, neither strategy is cost effective over the long run.

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B. Urban Forestry Objectives

Based upon the results of the 2003 inventory, ACRT advises the City of Arlington to focus upon the following objectives in the management of its urban forest resource.

1. Maintaining Safety in the Urban Forest

Maintaining the trees in the urban forest will help protect the safety of the residents and property. Removing dead and dying trees, pruning trees to clear for traffic control, and pruning or removing hazardous trees on the grounds will accomplish this objective.

2. Proactive Management of the Urban Forest

Adoption of a rotational pruning and inspection cycle will ensure that resource use is maximized in the avoidance of hazardous conditions. Identification and elimination of potential structural problems prior to their development as hazards will reduce long-term expenses and liability.

3. Perpetuating the Urban Forest

The urban forest is one of the most valuable resources in the urban infrastructure. New and replacement tree planting is required to perpetuate the community forest.

C. Maintaining the Safety of the Urban Forest

During the inventory, certain maintenance needs were identified that are required for maintaining public safety in the urban forest. These needs include sign clearance, removals, stumps and priority pruning.

The detection and remediation of potential hazards is the primary responsibility of any community forestry program.

While the inventory results provide a good baseline of current conditions, it is important to recognize that the urban forest is a dynamic, ever-changing mosaic. The status of the tree canopy will change and evolve over time. As such it is of utmost importance that the City routinely monitor the tree cover for changes in structure and condition. The detection and remediation of potential hazards is the primary responsibility of any community forestry program. ACRT's experience has shown that the number of removals in a managed urban forest could vary from 0.5 to 3 percent of the population annually. Arlington should continue to budget for this annual workload.

Given the recent assessment, the first major goal should be to complete the removal of identified hazards as soon as possible. Priority two removals and priority

one pruning should immediately follow sign clearance pruning and priority one removals. ACRT recommends that the City conduct a hazard tree survey every summer to identify future removals, hazard pruning, and sign clearance problems as they occur. Prompt detection is the first line of defense in reducing the exposure of the citizenry to excessive risk. Identification of hazards and changes in tree condition are best assessed in the late summer or early fall period when tree stress is most evident.

1. Sign Clearance

Top priority should continue to go towards trees and limbs obstructing traffic control signs (stop signs, yield signs and stoplights). Signs that are partially or completely concealed by tree limbs create an increased chance of a vehicular accident and municipal liability. In addition to the annual hazard windshield survey, the City should consider inspections for unencumbered sign visibility be conducted on no less than a quarterly basis.

2. Removals

Tree removals are the next priority. Fifty-seven priority one removals and 102 priority two removals were identified in the medians and along the street rights-of-way. Prompt removal is advised.

Trees that require removal can be undertaken either by City personnel or by contractors. Many cities will have small trees removed by City personnel, and will have the larger, more difficult trees removed by a contractor. Since 80% of these trees are under 6" in diameter, it may be more economical for Arlington to remove these plants in-house. If sufficient funds are not available to remove all the trees, ACRT recommends that trees listed as priority one removals be completed first.

ACRT recommends that public relations be made an integral and routine part of the urban forestry program, in particular for tree removal. Trees can be considered "charismatic mega-flora" and typically elicit strong emotional reactions from people. Many decayed trees appear to be "healthy" to the untrained observer and may not appear to require removal to concerned citizens. Adequate public relations should address the reason for removal, stress that removals are part of a long-term management plan, and that tree planting is planned to offset the tree being removed. When work starts on a tree in the front of a resident's house, it should not be a surprise to the owner of the property.

3. Priority Pruning

Pruning for safety enhancement should be undertaken immediately following the priority one removals. Trees that require priority pruning all have major deadwood, broken branches or hangers in the crown that could cause bodily injury or property damage.

All street trees should be pruned to the ANSI A300 Standard Practices for

Trees, Shrubs and Other Woody Plant Maintenance (see Appendix C). When a tree is trimmed, the *entire* tree should be trimmed to minimum specifications. If trees are pruned to specifications in a timely manner, the City will realize several major benefits, including improved condition of the trees, enhanced longevity of many of the mature trees, and an increase in property values as well as in the appraised dollar value of the trees.

Pruning should be started as soon as possible after the removals are completed. Nearly all large trees will need to be contracted during this phase of the work because specialized equipment and skills will be required.

4. Stump Removal

The existing stumps should be removed for safety and aesthetic reasons. Large stumps should be ground out 6 inches below grade. Many cities conserve resources by cutting small stumps flush at the ground level or slightly below grade. Other cities will pull small stumps out.

There were 465 stumps found in Arlington's street population. Ninety (90) percent of these are under 6 inches in diameter. It is important that the City remove stumps to eliminate liability and to prepare the site for tree replacement. Stump removal will also help to avoid unnecessary damage to lawn maintenance equipment.

D. Proactive Management

The need to maintain trees has never been greater than it is today. Maintaining trees with routine pruning schedules, and insect and disease management where needed, will increase the sustainability and safety of the urban forest. **Routine maintenance will also help reduce future expenditures for correction or removal of hazardous branches or trees.**

Without routine management, the stresses on trees in urban situations greatly reduce their functional use in the landscape. Increasing the vigor of the urban forest will benefit the City by extending the duration of environmental benefits produced by trees, and by increasing the value of this resource.

The scientific community continues to quantify the benefits of trees in the landscape. Among the most important of these is energy conservation. Strategically planted trees can shield buildings from cold winds in the winter and intense sunlight in summer. These are benefits that directly conserve energy. Indirect effects such as shading parking lots which re-radiate sunlight as heat, and cooling through evapotranspiration help to reduce urban heat islands. This translates to less fossil fuel emissions by power plants, and therefore less

Routine maintenance will also help reduce future expenditures for correction or removal of hazardous branches or trees.

"greenhouse gases" including carbon dioxide in the atmosphere.

Programs such as American Forests' Global ReLeaf assist communities in planting new trees. A well-stocked and cared for urban forest is one way to "think globally and act locally."

1. Pruning Cycles

The trees on the streets and medians of Arlington should be placed in a program where they are periodically scheduled for pruning. This program will provide the community with the benefits of routine pruning listed in the figure below.

Each tree should be pruned according to an organized cycle. The ideal pruning cycle varies considerably based on many factors, including tree age, tree species and budget restrictions. ACRT's experience has been that a pruning cycle of more than eight years is ineffective in any situation.

ACRT recommends that immature trees undergo a pruning cycle of twice the frequency of mature trees. Given the large percentage of the City trees that are in the routine small category (71%), and to provide constancy with the previous management plan, ACRT has based budget calculations on a five-year time frame.

Figure 9. Benefits of a routine pruning program.

- Improved cost-effectiveness by pruning trees when they are smaller and can be pruned at minimal cost.
- Lower municipal liability from potential tree related injuries or damages resulting from hazardous conditions.
- Fewer priority service requests.
- Improved overall condition of trees resulting in higher appraised dollar value.
- Increased property values due to improved condition and higher dollar values for tree populations.
- Lower cost per tree trimmed compared to pruning only for sign clearance and storm damage on an emergency basis.
- Reduced potential storm damage to trees and possibility of power outages caused by failure of weak or dead limbs.
- Improved tree appearance and enhanced aesthetic value to the City.
- Fewer tree mortalities through early identification and correction of disease and insect problems.
- Improved urban environment including maximum amounts of shade and cooling, noise and glare reduction, and pollution control.
- Improved public relations.

Ideally, pruning should take place in mid- to late-winter before buds begin to swell in early spring. Pruning should be avoided during spring and early summer when sap flow is at a peak. If pruning is undertaken while leaves are on deciduous trees, it should be restricted to mid-summer through fall. The majority of annual growth has taken place by this time, and pruning will be less stressful to the trees. A disadvantage to pruning at this time of year is the elevated levels of fungal spores present during the fall.

2. Maintenance Recommendations

As the City of Arlington has addressed the proactive training of the majority of the new plants, ACRT advises focusing on routine rotational pruning. Placing trees on a rotational cycle will enable the City to preventively address potential hazards and enhance the detection of insect an disease activity.

To Tree or Not to Tree.....

E. Perpetuating the Urban Forest

The future of the urban forest in Arlington depends on an active, progressive replacement and reforestation program. To account for failed plantings, damage and vandalism, the street tree planting rate must exceed the rate at which dead or damaged trees are removed. ACRT again recommends that the planting rate be at least 1.2 times the removal rate in order to maintain the current population of street trees. This planting rate will not increase the size of the overall street tree population; it will merely maintain the current level. Funding must be maintained for forest perpetuation. Failing to fund planting will, in effect, plant the seeds of forest failure.

Failing to fund planting will, in effect, plant the seeds of forest failure.

The inventory identified 465 stump locations that are potential sites for tree replacement. These vacant locations are currently not contributing to the canopy cover in Arlington and are in effect, a resource unutilized. ACRT recommends the restocking of these sites over a five-year time frame.

It is important to recognize that tree planting will have the greatest impact if it is part of a long-term urban forestry plan developed by the City. Haphazard, random, and uncoordinated planting is counterproductive and seldom produces the desired long-term impact.

In order to maximize the effectiveness of public tree planting and minimize future liability, the appropriate authorities (planning, public works, utilities, etc.) should evaluate planting plans and sites for suitability. A qualified City official should monitor all planting on City property and City planting on private property.

Poor Planning = Unnecessary Liability Exposure

An approved species list for Arlington, as well as additional recommendations are found in the Appendices. This City approved list should be maintained and updated as new varieties become available. Arlington should continue to evaluate other successful street tree cultivars and varieties available in the Northeastern Texas area.

Proper planting and a post-planting care program are required to ensure the survival and continued health of newly planted trees. Tree mortality occurs after planting when trees are improperly installed or not given adequate follow-up care. If staking is used, it should be removed after one growing season. Staking left in place longer than one season may injure and begin to girdle trees. Tree wraps should also be removed after one year. Mulching is extremely beneficial to trees. The ample availability and low cost of wood chip mulch should facilitate the use of mulch on newly planted trees. Mulch should not be piled around the stem of the tree or be greater than 4 inches in depth. The biggest survival problem that new trees have is with water. Too little and too much water can greatly reduce the survivability rate of new plantings. Deep, infrequent waterings should be used to saturate the soil to a depth of 2 to 3 feet.

Proper planting and a post planting care program is required to ensure the survival and continued health of newly planted trees.

All planting should be contracted to a reputable firm. Nursery stock should be carefully selected using the ANSI Standard for Nursery Stock (Appendix G). The size of new street trees should be 1.2 to 2 inches in diameter, unless survival or vandalism becomes more of a problem, in which case larger stock should be considered. Trees that are at least 2 inches in diameter at the time of planting are less likely to be broken by accident or vandalism, but they do have drawbacks worth considering. First, these larger-diameter trees are considerably more expensive to purchase, transport and install than smaller-diameter trees. Secondly, a lower percentage of roots remain in the root ball of larger trees at the time of transplant. In general, larger trees will experience more transplant shock, have higher rates of failure, and exhibit slower growth rates in the five years following planting than smaller trees. Since smaller trees take to transplanting more easily, they may catch up to or exceed the size of larger transplanted trees within five to ten years.

If plantings are being made by street or block side, the City should contract for the entire planting. A contract provision that allows inspection before trees are delivered, with a guarantee that the trees will be alive and growing after one year, accompanied by a maintenance bond will assure that trees will be replaced if they die. Homeowners and businesses should be notified of tree planting operations and encouraged to assist in the watering.

F. Resource Requirements

Tables 3, 4, 5 and 7 detail the proposed budget for Arlington's tree maintenance, planting and removal needs. Projections have been based upon the 2003 inventory data. Calculations and assumptions used in deriving totals for these tables are detailed in the appendices. This budget assumes that all work is done by contract labor. There is a strong possibility of completing much of the work at a lower cost by using City personnel for activities that can be accomplished from ground level, including small tree pruning training, and post-planting tasks. Several assumptions are made for this budget, including:

a. The cost estimates for removal, priority pruning and stump removal are detailed in Tables 3, 4 and 5.

b. Contract labor rates are estimated at $40 per work-hour for pruning and $45 per work-hour for removal.

c. Small tree pruning production is one-half an hour per tree.

d. Large tree pruning production is 2.2 hours per tree.

e. Sign clearance pruning production is .75 hours per tree.

f. Tree planting costs are assumed at $250 per 1.2 to 2 inch balled and burlapped tree.

g. No adjustments are made for increases in the size of the tree population.

h. Removals in 2003 are from the inventory. Following years assume a 3 percent mortality rate for large trees and a 1 percent mortality rate for small and immature trees.

i. Stumps removal costs are estimated at $2.50/inch.

j. Systematic pruning costs were figured for the recommended cycle: five years for large trees and three years for small trees.

k. Stumps should be considered potential planting sites.

l. Replacement plantings are calculated from 1.2 times the total of all removals.

Table 3. Budget detail: tree removal for all inventoried trees.

Maintenance	DBH inches	Trees	Work-hours per Tree	Cost per Work-hour	Total Cost
Removal Priority One	1-6	30	2.1	$45	$2,835
	7-12	11	3.2	$45	$1,583
	13-18	8	5.1	$45	$1,836
	19-24	2	7.7	$45	$693
	25-30	6	10.2	$45	$2,754
	31-36	0	12.5	$45	$0
	Over 36	0	26.3	$45	$0
Subtotal:	–	**57**	–	–	**$9,701**
Removal Priority Two	1-6	96	2.1	$45	$9,072
	7-12	5	3.2	$45	$720
	13-18	1	5.1	$45	$229
	19-24	0	7.7	$45	$0
	25-30	0	10.2	$45	$0
	31-36	0	12.5	$45	$0
	Over 36	0	26.3	$45	$0
Subtotal:	–	**102**	–	–	**$10,021**
TOTAL:	–	**159**	–	–	**$19,722**

Table 4. Budget detail: priority pruning for all inventoried trees.

Maintenance	DBH inches	Trees	Work-hours per Tree	Cost per Work-hour	Total Cost
Priority One Prune	1-6	2	1	$40	$80
	7-12	1	1.4	$40	$56
	13-18	9	2.8	$40	$1,008
	19-24	6	3.5	$40	$840
	25-30	2	5.1	$40	$408
	31-36	0	6.3	$40	$0
	Over 36	0	6.3	$40	$0
Subtotal:	-	**20**	-	-	**$2,392**
Priority Two Prune	1-6	36	1	$40	$1,440
	7-12	20	1.4	$40	$1,120
	13-18	31	2.8	$40	$3,472
	19-24	10	3.5	$40	$1,400
	25-30	3	5.1	$40	$612
	31-36	0	6.3	$40	$0
	Over 36	0	6.3	$40	$0
Subtotal:	-	**100**	-	-	**$8,044**
TOTAL:	-	**120**	-	-	**$10,436**

Table 5. Budget detail: stump removal for all inventoried trees.

Maintenance	DBH inches	Stumps	Price per DBH inch	Price per Stump	Total Cost
Stump Removal	1-6	421	$2.5	$7.5	$3,157
	7-12	27	$2.5	$22.5	$607
	13-18	12	$2.5	$37.5	$450
	19-24	4	$2.5	$52.5	$210
	25-30	1	$2.5	$67.5	$67
	31-36	0	$2.5	$82.5	$0
	Over 36	0	$2.5	$97.5	$0
TOTAL:	-	**465**	-	-	**$4,491**

Table 6. Budget projections for removing hazardous and potentially hazardous conditions for all inventoried trees.

Tasks to Maintain the Safety of the Urban Forest	1st Priority		2nd Priority		3rd Priority	
	Amount	Dollars	Amount	Dollars	Amount	Dollars
Removal	57	$9,701	102	$10,021		
Stumps					465	$4,491
Priority Pruning			20	$2,744	120	8,044
Subtotal	57	$9,701	122	$12,765	585	$12,535
Total						**$35,001**

**1st Priority:* Hazardous conditions requiring immediate action include sign clearance pruning and priority one removals. These tasks should be completed within six months.
2nd Priority: Hazardous conditions requiring prompt action include priority two removals and priority one pruning. These tasks should be completed within one year.
3rd Priority: Potentially hazardous conditions include priority two pruning and stump removals. These tasks should be completed within two years.

Table 7. Annual budget projections for inventoried trees.

Maintenance Tasks		Annual Projections	
		Amount	Dollars
Maintaining the Safety of the Urban Forest	Priority Removal	27	$4,590
	Priority Pruning	58	$5,046
	Subtotal	85	$9,636
Proactive Management of the Urban Forest (Routine Maintenance)	Train Trees	93	$1,860
	Small Tree Pruning	789	$15,780
	Large Tree Pruning	155	$13,640
	Non-hazard Removal	42	$4,116
	Subtotal	1079	$35,396
Perpetuating the Urban Forest (Planting)	Replacements	171	$42,750
	Subtotal	171	$42,750
Total for Maintenance Tasks:		**1335**	**$87,782**

G. Administering Contracts

Contracting tree work to qualified, reputable tree care companies is an efficient street tree maintenance approach, but it requires careful administration to obtain the desired results.

Contracting operations can be administered by City personnel or by an independent contractor such as ACRT. Administration costs are approximately 5 to 10 percent of the budget. Seasonal timing of contracts and favorable contract guidelines can save the City from 10 to 15 percent of the typical contract costs.

Basic contracting procedures and guidelines follow:

a. Define scope of work (planting, removal, trimming, stump removal), type of contract, and time frame.

b. Identify involved parties (contractor, contract administrator).

c. Define material specifications (work procedures, standards such as National Arborist Association trimming standards, ANSI Standards for Nursery Stock, etc.).

d. Define procedures to follow in the event that there is a discrepancy in the scope of work (such as the need to substitute the defined planting stock in the planting contract).

e. List inspections to be performed (on nursery stock, pruning cuts, clean-up, etc.).

f. List situations where rejecting work could occur (improper planting depth, improper pruning cuts, etc.).

g. List trees to be planted, removed or trimmed by address and block side. For accuracy and to avoid confusion, planting lists should include the scientific name and qualifications regarding acceptable size of stock.

h. Outline bid sheet and bonding requirements.

There are several ways to improve the cost-effectiveness of a contracting program. Arrange contracts for tree trimming and removal in the fall or winter, which is traditionally the "slow time" for tree care companies. Also, competitive prices can be obtained by specifying a longer time frame for completing the scope of work.

Tree planting contracts need to have a three-to-four month lead time to give the contractors time to locate and obtain the appropriate planting stock. The actual

time for planting the trees needs to be specified in the bid package to ensure that trees be planted at the appropriate planting times for the area.

Stumps should be ground to 4 to 6 inches below grade and excess materials removed. Soil and chips can be piled in the hole and mounded 4 to 8 inches above ground level to allow for settling.

H. Utility Wires

Serious conflicts have developed between utilities and street trees. More than one billion dollars spent annually by U.S. utilities on tree pruning are passed on as costs to consumers. Too often, trees have been disfigured by improper pruning and injured by excavation for underground wires and pipes. Mistreatment of trees has made people irate.

Many of these problems can be reduced through better understanding and planning. Improved arboricultural methods such as natural pruning instead of topping trees, or underground tunneling instead of trenching, can minimize adverse effects on the health and appearance of trees. But the preferred, long range solution is to avoid conflicts by selecting compatible trees and positioning them so they will not grow into utilities.

Electric service distributed through overhead wires is subject to interruption when branches touch the wires, or when storms cause trees to blow or fall into the wires. Utility companies are required to prune trees to prescribed distances, which vary with different line voltages and types of construction (American National Standards Institute 1988). The purpose of pruning is to ensure public safety to minimize interruptions or outages caused by trees, especially during storm emergencies. A major concern is the safety of children or others who may climb trees and be shocked or even electrocuted. Overhead electric wires are usually not insulated.

Electric wires can be recognized by the insulators, which fasten them to the poles or crossarms, typically at heights of 25 to 40 feet. Other wires lower on the same poles may include insulated telephone or cable TV lines, which must be protected only from branches that rub against them. Federal law requires that tree workers, other than qualified line clearance tree trimmers, maintain 10 feet of clearance from wires energized over 750 volts.

Some people complain strenuously when trees are disfigured by pruning, or when they hear of a proposal to remove large trees, especially several at a time. Topping of trees, sometimes called stubbing or rounding, not only destroys their natural form but also may adversely affect their health. Some of these concerns can be minimized by training workers to place pruning cuts so that they preserve the natural branching pattern. But where large trees are too close to wires, large

portions of their limbs must be pruned off. When trees deteriorate with age or urban stress and become hazards, they must be removed.

Why not bury wires? That is feasible only in new developments, where it has become commonplace. The expense usually would be prohibitive in older residential neighborhoods, and excavation would damage roots of the very trees that one wants to preserve. A better alternative is to gradually remove hazardous and disfigured trees, and to replace them with smaller trees that will not conflict with wires.

Underground electric installations require maintenance, too. Excavation for repairs can damage tree roots. Therefore, trees should be planted far enough away to permit access by equipment and to keep most roots clear of any trenches that may be dug in the future. Transformer boxes indicate where underground lines may be located.

A working relationship should be developed between those responsible for tree maintenance in the City and the utility companies. There are benefits for both through cooperation. The utility companies benefit by eliminating large-growing species under power and communication lines, pruning existing street trees under wires to avoid future problems, and removing problem street trees under wires. The City would benefit from a cooperative program with goals including a street tree replacement program (paid for in part by the utility) to remove problem maintenance street trees and replace them with low growing species, the removal of some trees that are aesthetically unappealing and potentially hazardous, and the presence of healthy and well-shaped low growing trees under wires.

I. Inventory Updating

It is essential to maintain the current tree inventory for future budgeting and work scheduling. The workers and staff involved with the management of the street trees need to know how to keep the software up to date. These key people must know how to report what is done to any median or street tree and provide the information to the person responsible for updating the database.

Appendix A

Calculations and Assumptions for Annual Budget Projections

A. Hazard Tree Removals

Assume that 3% of the current large tree population will be removed annually due to damage, disease or death. The total number of large trees can be estimated by adding those trees currently scheduled for maintenance items - Removal 1, Prune 1, Prune 2 and Routine Large Pruning.

Projected Hazard Removals = (R1 + P1 + P2 + RL) x .03
= (57 + 20 + 100 + 713) x .03
= 27 Trees

To estimate the cost of hazard tree removals, establish the average projected cost of Removal 1 items identified in the inventory.

Average Hazard Tree Removal cost = Cost R1/#R1
= $9,701/57
= $170

Therefore, projected cost of hazard removals = 27 trees x $170/tree = $4,590

B. Non-Hazard Tree Removals

Assume that 1% of the current small tree population will be removed annually. The total number of small trees can be estimated by adding the number of those trees currently scheduled for maintenance items Removal 2, Routine Small, and Training.

Projected non-hazard removals = (R2 + RS + TR) x .01
= (102 + 3945 + 109) x .01
= 42 Trees

To estimate the cost of Non-hazard removals, establish the average projected cost of the Removal 2 item identified in the inventory.

Average non-hazard tree removal cost = cost R2/#R2
= $10,021/102
= $98

Therefore, projected cost of non-hazard removals = 42 trees x $98/tree = $4,116

C. Priority Pruning

The number of priority prunes can be projected by looking at the current population of large trees and observing what percentage is in need of priority pruning. The current number of large tree prunings can be determined by adding the number of Priority 1 Prunes, Priority 2 Prunes, and Routine Large items identified in the inventory.

Current large tree prunings = P1 + P2 + RL
= 20 + 100 + 713
= 833

Out of the current population of 833 large tree prunings, P1 and P2 represent the percentage of trees in need of pruning to correct hazardous conditions.

% hazard prunes = (P1 + P2)/833
= 120/833
= 14%

To project the annual number of hazard prunes, we will assume a five year rotation, and that the current 14% rate will drop by roughly 1/2 to 7%. The projected number of annual priority prunes can then be determined by multiplying the current total of large tree prunings by 7%.

Annual priority prunes = 833 x .07
= 58 trees

To estimate the cost of priority prunings, establish the average projected cost of P1 and P2 prunes identified in the inventory.

Average priority pruning cost = cost P1 + P2/# P1 +P2
= $10,436/120
= $87/tree

Therefore, the annual projected cost of priority prunings is:

= 58 trees x $87/tree
= $5,046

D. Routine Pruning of Large Trees

The projected number of large tree routine prunings can be determined by subtracting the projected annual priority prunings from the current large tree prunings. This number is then divided by 5 (the assumed rotation period).

= (P1 + P2 + RL) - Projected annual P1

= (833 - 58)/5

= 155 trees

Annual costs for routine pruning of large trees can be projected by using the estimated contractor rate of $40/hour for pruning and 2.2 hours of labor time per large tree.

= 155 x $40 x 2.2

= $13,640

E. Routine Pruning of Small Trees

Annual routine pruning of small trees can be estimated by dividing the total number of trees identified in the inventory for this maintenance activity by the number of years in the pruning cycle.

= # RS/ 5 years

= 3945/5

= 789 trees

Annual projected costs for small tree pruning can be estimated by assuming contract pruning rates of $40 per hour and a production rate of .5 hours per tree.

= 789 x $40 x .5

= $15,780

F. Replacement Plantings

For each stump and dead tree removed a new tree should be planted. This will maintain the current stocking level of the Arlington urban forest. A certain level of mortality should be expected on new plantings however. If we assume a 10% mortality rate the first year of planting, then it becomes necessary to plant at the rate of 1.1 times the number of removals if stocking is to be kept intact. Therefore:

Total replacement plantings = {(#hazard removals + #non-hazard removals + (current stumps/5 year replacement time)} x1.1

= (27 + 42 + 93) 1.1

= 171 trees

Assuming a cost of $250 per tree (including planting) the total cost for replacement plantings is:

= # replacement trees x $250

= 171 x $250

= $42,750

G. Training Pruning of Immature Trees

Annual training of immature trees can be estimated by adding the total number of trees to be trained in the inventory to the total number of new trees added as removal replacements. The annual cost is determined by dividing this number by the length of the cycle (3 years).

Annual # of trees to be trained = total training + replacements / 3

= (280) / 3

= 93 trees

Annual costs can be projected assuming contract rates of $40 per hour and production rates of .5 hours per tree.

= 40 x .5 x 93

= 1,860

Appendix B : Listing of trees recommended for removal

Priority one removal

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Criteria: Site.THEME_ID = "ANY" MAINT = "REMOVAL1"

STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
107TH ST	1100	9	OAK, SHUMARD	DBH	11	960
107TH ST	1101	1	OAK, LIVE	DBH	15	933
ABRAM ST	2000	10	ASH, GREEN	DBH	28	1562
ABRAM ST	2200	18	ASH, GREEN	DBH	22	1603
ARKANSAS LN	4500	10	PLUM	DBH	5	1757
ARKANSAS LN	4500	12	UNKNOWN TREE	DBH	2	1759
ARKANSAS LN	5100	12	UNKNOWN TREE	DBH	2	1729
ARKANSAS LN E	1900	29	OAK, SHUMARD	DBH	5	2043
AVENUE H	101	16	OAK, LIVE	DBH	15	928
BARDIN RD	1900	11	OAK, POST	DBH	17	3297
BARDIN RD	5000	22	OAK, SHUMARD	DBH	7	4598
COLLINS ST S	5100	7	OAK, BUR	DBH	4	2324
FIELDER RD	1900	18	HONEYLOCUST	DBH	5	593
FIELDER RD	1900	40	PISTACHE,	DBH	4	633
FIELDER RD	1900	45	OAK, BLACKJACK	DBH	12	638
FIELDER RD	2302	1	MULBERRY, RED	DBH	18	731
FIELDER RD	2600	1	OAK, BUR	DBH	5	813
FIELDER RD	2600	7	PEAR, CALLERY	DBH	6	819
FIELDER RD	2600	43	PEAR, CALLERY	DBH	4	855
FIELDER RD	2600	48	REDBUD,	DBH	3	860
GREAT	400	12	OAK, LIVE	DBH	28	1444
GREAT	600	9	OAK, LIVE	DBH	18	1458
GREAT	600	21	OAK, LIVE	DBH	17	1470
GREEN OAKS NE	1400	3	ELM, LACEBARK	DBH	5	5257
GREEN OAKS NE	2300	13	OAK, POST	DBH	15	125
GREEN OAKS NE	2300	19	GINKGO	DBH	4	131
GREEN OAKS NE	2400	3	GINKGO	DBH	3	135
GREEN OAKS NW	900	5	OAK, BUR	DBH	4	20
GREEN OAKS NW	900	7	CHERRY	DBH	3	22
GREEN OAKS SW	4500	4	REDBUD,	DBH	9	3922
GREEN OAKS W BL	4200	6	OAK, BLACKJACK	DBH	28	3998
GREEN OAKS W BL	4200	7	OAK, POST	DBH	9	3999
GREEN OAKS W BL	4200	12	OAK, POST	DBH	28	4004
LAMAR BL	1300	2	PECAN	DBH	28	462
LAMAR BL	1500	1	OAK, POST	DBH	25	467
LAMAR BL	1800	8	OAK, SHUMARD	DBH	4	505
LAMAR BL	1800	10	MAPLE, RED	DBH	6	507
LAMAR BL	1900	12	MAPLE, RED	DBH	4	519
LAMAR BL E	500	32	CEDAR, EASTERN	DBH	12	263
LAMAR BL E	1000	4	UNKNOWN TREE	DBH	2	303
LAMAR BL E	1000	5	UNKNOWN TREE	DBH	2	304
LAMAR BL E	1000	7	UNKNOWN TREE	DBH	2	306
LAMAR BL E	1000	7.2	UNKNOWN TREE	DBH	2	5189
LAMAR BL E	1600	6	ELM, CEDAR	DBH	10	365
LAMAR BL E	2300	3	CREPEMYRTLE	DBH	3	394
LAMAR BL E	2300	4	CREPEMYRTLE	DBH	4	395
LAMAR BL E	2300	14	OAK, POST	DBH	10	405
LAMAR BL E	2300	20	OAK, POST	DBH	14	411
NEW YORK AV	2400	10	ELM, SLIPPERY	DBH	4	2717
NEW YORK AV	3000	10	OAK, LIVE	DBH	11	2778
NEW YORK AV	3000	23	ELM, SLIPPERY	DBH	3	2791
PLEASANT RIDGE	2400	7	REDBUD,	DBH	4	3258

Priority one removal

Run Date: 5/15/2003 10:56:23 AM

Criteria: Site.THEME_ID = "ANY" MAINT = "REMOVAL1"

STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
SIX FLAGS DR	800	8	FIR, DOUGLAS	DBH	24	1493
STATE HWY	100	53	PINE, AUSTRIAN	DBH	8	1133
STATE HWY	100	144	PINE, AFGHAN	DBH	4	1224
STATE HWY	100	163	PINE, AFGHAN	DBH	7	1243
SUBLETT RD	1600	39	ELM, CEDAR	DBH	3	5354

Totals = 57

Priority two removals

Run Date: 5/15/2003 10:50:14 AM Page# 1

Criteria: Site.THEME_ID = "ANY" MAINT = "REMOVAL2"

STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
ABRAM ST	1700	11	PEAR, CALLERY	DBH	5	1531
ABRAM ST	1900	7	PLUM	DBH	6	1541
ABRAM ST	2200	14	UNKNOWN SHRUB	DBH	8	1599
ABRAM ST	2200	16	PEAR, CALLERY	DBH	4	1601
ABRAM ST	2600	35	PEAR, CALLERY	DBH	5	1647
ARKANSAS LN	5400	3	UNKNOWN SHRUB	DBH	3	1734
ARKANSAS LN E	800	8	REDBUD,	DBH	0	1926
BALLPARK WAY	1300	4	GOLDENRAIN	DBH	3	1016
BALLPARK WAY	1300	5	GOLDENRAIN	DBH	4	1017
BARDIN RD	1902	63	PISTACHE,	DBH	2	4833
BARDIN RD	1902	64	PISTACHE,	DBH	2	4834
BARDIN RD	5000	10	OAK, SHUMARD	DBH	3	4586
BOWEN RD	4500	6	OAK, CHINKAPIN	DBH	4	3334
BOWEN RD	4500	13	REDBUD,	DBH	2	3341
BOWEN RD	4500	14	REDBUD,	DBH	3	3342
BOWEN RD	5600	5	ELM, WINGED	DBH	2	4866
CENTER ST S	1600	22	ELM, CEDAR	DBH	3	3435
CENTER ST S	1700	5	POSSUMHAW	DBH	1	3460
CENTER ST S	1700	15	ELM, CEDAR	DBH	7	3470
CENTER ST S	1700	16	ELM, CEDAR	DBH	6	3471
CENTER ST S	1700	18	ELM, CEDAR	DBH	4	3473
CENTER ST S	1700	19	ELM, CEDAR	DBH	3	3474
CENTER ST S	1700	20	ELM, CEDAR	DBH	5	3475
CENTER ST S	1700	21	ELM, CEDAR	DBH	3	3476
CENTER ST S	1700	23	ELM, CEDAR	DBH	5	3478
COLLINS ST S	5500	45	PEAR, CALLERY	DBH	5	2445
COPELAND RD	1001	39	CHINESE	DBH	1	4672
COPELAND RD	1201	17	PLUM	DBH	3	4679
FIELDER RD	1901	16	OAK, BLACKJACK	DBH	4	611
FIELDER RD	2102	20	CHINESE	DBH	4	690
FIELDER RD	2300	25	REDBUD,	DBH	3	739
GRANT PKWY	900	1	ELM, CEDAR	DBH	6	5176
GREEN OAKS NE	2600	12	HOLLY, YAUPON	DBH	1	5309
GREEN OAKS NE	2600	15	ELM	DBH	3	5312
GREEN OAKS SE	100	7	OAK, SHUMARD	DBH	4	3823
GREEN OAKS SE	100	22	OAK, SHUMARD	DBH	5	3838
GREEN OAKS SE	100	28	ELM, LACEBARK	DBH	5	3844
GREEN OAKS SE	300	5	CREPEMYRTLE	DBH	1	3765
GREEN OAKS SE	500	10	OAK, CHINKAPIN	DBH	4	3674
GREEN OAKS SE	500	35	REDBUD,	DBH	3	3699
GREEN OAKS SE	500	41	BALDCYPRESS	DBH	6	3705
GREEN OAKS SE	500	80	POSSUMHAW	DBH	1	3744
GREEN OAKS SE	900	17	OAK, CHINKAPIN	DBH	4	3593
GREEN OAKS SE	900	68	BALDCYPRESS	DBH	4	3644
HARWOOD RD	1900	3	POSSUMHAW	DBH	1	2450
LAMAR BL	1701	16	HACKBERRY	DBH	6	877
LAMAR BL	2100	3	OAK, SHUMARD	DBH	3	574
LAMAR BL E	1000	2	UNKNOWN TREE	DBH	1	301
LAMAR BL E	1500	8	OAK, SHUMARD	DBH	3	339
LAMAR BL E	2300	23	ELM, CEDAR	DBH	7	414
MATLOCK RD	3500	23	OAK, SHUMARD	DBH	2	3028
MATLOCK RD	3500	25	OAK, SHUMARD	DBH	3	3030

Priority two removals

Run Date: 5/15/2003 10:50:14 AM

Criteria: Site.THEME_ID = "ANY" MAINT = "REMOVAL2"

STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
MATLOCK RD	4900	13	PLUM	DBH	4	3104
MAYFIELD RD E	1500	4	PISTACHE,	DBH	1	5162
MAYFIELD RD E	1600	8	REDBUD,	DBH	1	2129
NEW YORK AV	3200	6	PLUM	DBH	3	2805
NEW YORK AV	3300	11	ELM, SLIPPERY	DBH	5	2827
NEW YORK AV	3800	7	PLUM	DBH	3	2705
NEW YORK AV	4100	9	ELM, LACEBARK	DBH	4	2681
NEW YORK AV	4100	10	ELM, LACEBARK	DBH	4	2682
NEW YORK AV	4300	1	PISTACHE,	DBH	6	2653
NEW YORK AV	4900	21	GOLDENRAIN	DBH	3	2568
NEW YORK AV	5400	7	OAK, SHUMARD	DBH	4	2547
NEW YORK AV	5400	8	REDBUD,	DBH	3	5151
PIONEER PW	400	8	SOPHORA, TEXAS	DBH	1	4206
PIONEER PW	400	14	PINE, AFGHAN	DBH	4	4212
PIONEER PW	1300	38	GINKGO	DBH	2	4107
PIONEER PW	2000	52	ELM, LACEBARK	DBH	3	4378
PIONEER PW	2900	40	SOPHORA, TEXAS	DBH	2	4445
PIONEER PW	3100	20	HOLLY, YAUPON	DBH	1	4507
PIONEER PW	3200	9	HOLLY, YAUPON	DBH	1	4518
PIONEER PW	3200	18	SOPHORA, TEXAS	DBH	2	4527
RICHMOND AV	2300	1	ELM, CEDAR	DBH	5	1947
SIX FLAGS DR	2600	2	OAK, SHUMARD	DBH	3	1502
SIX FLAGS DR	2600	3	OAK, SHUMARD	DBH	3	1503
SIX FLAGS DR	2600	4	OAK, SHUMARD	DBH	3	1504
STATE HWY	100	3	BALDCYPRESS	DBH	3	1083
STATE HWY	100	4	BALDCYPRESS	DBH	3	1084
STATE HWY	100	12	PINE, AFGHAN	DBH	7	1092
STATE HWY	100	23	BALDCYPRESS	DBH	3	1103
STATE HWY	100	32	PINE, AFGHAN	DBH	6	1112
STATE HWY	100	33	PINE, AFGHAN	DBH	8	1113
STATE HWY	100	47	PINE, AFGHAN	DBH	6	1127
STATE HWY	100	55	PINE, AUSTRIAN	DBH	5	1135
STATE HWY	100	61	REDBUD,	DBH	5	1141
STATE HWY	100	63	REDBUD,	DBH	3	1143
STATE HWY	100	67	BALDCYPRESS	DBH	2	1147
STATE HWY	100	70	BALDCYPRESS	DBH	2	1150
STATE HWY	100	91	PINE, AUSTRIAN	DBH	3	1171
STATE HWY	100	94	CEDAR, EASTERN	DBH	3	1174
STATE HWY	100	104	BALDCYPRESS	DBH	2	1184
STATE HWY	100	105	BALDCYPRESS	DBH	2	1185
STATE HWY	100	106	OAK, BUR	DBH	16	1186
STATE HWY	100	157	PINE, AFGHAN	DBH	5	1237
STATE HWY	100	177	PINE, AFGHAN	DBH	6	1257
STATE HWY	100	193	REDBUD,	DBH	3	1273
STATE HWY	100	212	REDBUD,	DBH	1	1292
STATE HWY	100	213	REDBUD,	DBH	2	1293
STATE HWY	100	240	OAK, BLACKJACK	DBH	4	1320
SUBLETT RD	1200	1	REDBUD,	DBH	1	4966
SUBLETT RD	2100	32	UNKNOWN TREE	DBH	1	5029
TEAKWOOD DR	100	8	REDBUD,	DBH	3	1905

Priority two removals

Site.THEME_ID = "ANY"
MAINT = "REMOVAL2"

Criteria:

STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:

Totals = 102

Appendix C: Listing of trees recommended for priority pruning

Priority one and two prune

Run Date: 5/15/2003 10:54:14 AM Page# 1

Criteria:

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Site.THEME_ID = "ANY"
MAINT = "PRUNE1"
MAINT = "PRUNE2"
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STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
107TH ST	1100	16	OAK, SHUMARD	MAINT	PRUNE2	953
107TH ST	1100	17	OAK, SHUMARD	MAINT	PRUNE2	952
107TH ST	1101	3	OAK, LIVE	MAINT	PRUNE2	935
107TH ST	1101	4	OAK, LIVE	MAINT	PRUNE2	936
107TH ST	1101	5	OAK, LIVE	MAINT	PRUNE2	937
107TH ST	1101	6	OAK, LIVE	MAINT	PRUNE2	938
107TH ST	1101	7	OAK, LIVE	MAINT	PRUNE2	939
107TH ST	1101	10	OAK, LIVE	MAINT	PRUNE2	942
107TH ST	1101	13	OAK, LIVE	MAINT	PRUNE2	945
ABRAM ST	1900	12	AMERICAN	MAINT	PRUNE1	1546
ABRAM ST	2100	1	ASH, GREEN	MAINT	PRUNE1	1576
ARBROOK BL	900	9	POSSUMHAW	MAINT	PRUNE2	3140
ARKANSAS LN E	1700	15	AMERICAN	MAINT	PRUNE1	2009
AVENUE H	101	1	OAK, SHUMARD	MAINT	PRUNE1	913
AVENUE H	101	2	OAK, SHUMARD	MAINT	PRUNE2	914
AVENUE H	101	4	OAK, SHUMARD	MAINT	PRUNE1	916
AVENUE H	101	5	OAK, SHUMARD	MAINT	PRUNE1	917
AVENUE H	101	6	OAK, SHUMARD	MAINT	PRUNE1	918
AVENUE H	101	7	OAK, LIVE	MAINT	PRUNE1	919
AVENUE H	101	8	OAK, LIVE	MAINT	PRUNE2	920
AVENUE H	101	15	OAK, LIVE	MAINT	PRUNE2	927
AVENUE H	101	17	OAK, LIVE	MAINT	PRUNE2	929
AVENUE H	101	18	OAK, LIVE	MAINT	PRUNE1	930
AVENUE H	101	19	OAK, LIVE	MAINT	PRUNE2	931
AVENUE H	101	20	OAK, LIVE	MAINT	PRUNE2	932
AVENUE H	800	1	HOLLY, YAUPON	MAINT	PRUNE1	429
AVENUE H	800	2	OAK, LIVE	MAINT	PRUNE2	430
AVENUE H	800	5	OAK, LIVE	MAINT	PRUNE1	433
AVENUE H	800	8	OAK, SHUMARD	MAINT	PRUNE2	436
BALLPARK WAY	1800	9	ELM, CEDAR	MAINT	PRUNE2	1009
BALLPARK WAY	1850	2	OAK, POST	MAINT	PRUNE1	981
CENTER ST S	1800	17	PECAN	MAINT	PRUNE2	3511
COLLINS ST S	4200	9	PISTACHE,	MAINT	PRUNE2	2207
COLLINS ST S	4700	19	ELM, LACEBARK	MAINT	PRUNE2	2262
COLLINS ST S	4700	27	HOLLY, YAUPON	MAINT	PRUNE2	2270
COLLINS ST S	4900	26	DESERT-WILLOW	MAINT	PRUNE2	2297
COLLINS ST S	4900	30	DESERT-WILLOW	MAINT	PRUNE2	2301
COPELAND RD	1001	3	ELM, AMERICAN	MAINT	PRUNE2	4626
COPELAND RD	1001	4	ELM, AMERICAN	MAINT	PRUNE2	4627
COPELAND RD	1001	31	SOPHORA, TEXAS	MAINT	PRUNE2	4654
COPELAND RD	1001	32	SOPHORA, TEXAS	MAINT	PRUNE2	4655
DRUMMOND	700	2	PINE, SLASH	MAINT	PRUNE2	1692
FIELDER RD	1900	38	REDBUD,	MAINT	PRUNE2	631
FIELDER RD	1901	6	OAK, BLACKJACK	MAINT	PRUNE2	603
FIELDER RD	1901	9	OAK, BLACKJACK	MAINT	PRUNE2	600
FIELDER RD	1901	11	OAK, BLACKJACK	MAINT	PRUNE2	598
FIELDER RD	1901	12	OAK, BLACKJACK	MAINT	PRUNE2	597
FIELDER RD	1901	13	OAK, BLACKJACK	MAINT	PRUNE2	596
FIELDER RD	1901	17	PECAN	MAINT	PRUNE1	612
FIELDER RD	1901	18	PECAN	MAINT	PRUNE1	613
FIELDER RD	2100	27	PEAR, CALLERY	MAINT	PRUNE2	668
FIELDER RD	2102	3	OAK, POST	MAINT	PRUNE2	707

Priority one and two prune

Run Date: 5/15/2003 10:54:15 AM

Criteria:

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Site.THEME_ID = "ANY"
MAINT = "PRUNE1"
MAINT = "PRUNE2"
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STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
FIELDER RD	2300	19	REDBUD,	MAINT	PRUNE2	733
FIELDER RD	2300	56	REDBUD,	MAINT	PRUNE2	770
GREAT	600	15	OAK, LIVE	MAINT	PRUNE2	1464
GREAT	600	16	OAK, LIVE	MAINT	PRUNE2	1465
GREAT	600	17	OAK, LIVE	MAINT	PRUNE2	1466
GREAT	600	22	OAK, LIVE	MAINT	PRUNE2	1471
GREAT	600	29	OAK, LIVE	MAINT	PRUNE2	1478
GREAT	900	2	OAK, LIVE	MAINT	PRUNE2	903
GREAT	1000	1	OAK, LIVE	MAINT	PRUNE2	906
GREAT	1000	4	OAK, LIVE	MAINT	PRUNE2	909
GREEN OAKS NE	1400	7	ELM, LACEBARK	MAINT	PRUNE2	5261
GREEN OAKS NE	1400	8	ELM, LACEBARK	MAINT	PRUNE2	5262
GREEN OAKS NE	1400	9	ELM, LACEBARK	MAINT	PRUNE2	5263
GREEN OAKS NE	1400	18	OAK, POST	MAINT	PRUNE2	5272
GREEN OAKS NE	1400	32	ELM, LACEBARK	MAINT	PRUNE2	5287
GREEN OAKS NE	2200	4	MESQUITE	MAINT	PRUNE1	97
GREEN OAKS NE	2300	15	HOLLY, YAUPON	MAINT	PRUNE2	127
GREEN OAKS NW	1100	21	PLUM	MAINT	PRUNE2	53
GREEN OAKS SE	300	6	CREPEMYRTLE	MAINT	PRUNE2	3766
GREEN OAKS SE	300	16	MEXICAN-	MAINT	PRUNE2	3776
GREEN OAKS SE	300	24	MEXICAN-	MAINT	PRUNE2	3784
GREEN OAKS SE	300	50	CREPEMYRTLE	MAINT	PRUNE2	3810
GREEN OAKS SE	500	77	CREPEMYRTLE	MAINT	PRUNE2	3741
GREEN OAKS SE	500	78	POSSUMHAW	MAINT	PRUNE2	3742
GREEN OAKS SE	900	46	HOLLY, YAUPON	MAINT	PRUNE2	3622
GREEN OAKS SE	900	65	BALDCYPRESS	MAINT	PRUNE2	3641
GREEN OAKS SE	900	66	BALDCYPRESS	MAINT	PRUNE2	3642
GREEN OAKS SW	4300	18	CREPEMYRTLE	MAINT	PRUNE2	3914
GREEN OAKS W BL	1300	5	ELM, LACEBARK	MAINT	PRUNE2	4009
GREEN OAKS W BL	1300	15	CREPEMYRTLE	MAINT	PRUNE2	4019
GREEN OAKS W BL	1300	19	CREPEMYRTLE	MAINT	PRUNE2	4023
LAMAR BL	1701	10	OAK, POST	MAINT	PRUNE2	871
LAMAR BL	1701	17	OAK, POST	MAINT	PRUNE1	878
LAMAR BL	1701	26	HACKBERRY	MAINT	PRUNE2	887
LAMAR BL	1901	4	OAK, POST	MAINT	PRUNE2	544
LAMAR BL	1902	3	COTTONWOOD,	MAINT	PRUNE2	566
LAMAR BL E	900	3	PINE, JAPANESE	MAINT	PRUNE2	298
LAMAR BL E	1500	23	CREPEMYRTLE	MAINT	PRUNE1	354
LAMAR BL E	2000	7	PECAN	MAINT	PRUNE1	375
LAMAR BL E	2000	13	OAK, POST	MAINT	PRUNE2	381
LAMAR BL E	2300	15	OAK, POST	MAINT	PRUNE1	406
LAMAR BL E	2300	21	OAK, POST	MAINT	PRUNE2	412
LAMAR BL E	2300	25	OAK, POST	MAINT	PRUNE1	416
LAMAR BL E	2300	27	OAK, POST	MAINT	PRUNE2	418
MAYFIELD RD E	1000	4	OAK, SHUMARD	MAINT	PRUNE2	2175
MAYFIELD RD E	1600	7	REDBUD,	MAINT	PRUNE2	2128
MAYFIELD RD E	1600	10	REDBUD,	MAINT	PRUNE2	2131
MAYFIELD RD E	1600	16	REDBUD,	MAINT	PRUNE2	2137
MAYFIELD RD E	2300	3	OAK, SHUMARD	MAINT	PRUNE2	2078
NEW YORK AV	2400	5	ELM, SLIPPERY	MAINT	PRUNE2	2712
NEW YORK AV	2400	6	ELM, SLIPPERY	MAINT	PRUNE2	2713
NEW YORK AV	3000	1	OAK, LIVE	MAINT	PRUNE2	2769

Priority one and two prune

Run Date: 5/15/2003 10:54:15 AM

Criteria:

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Site.THEME_ID = "ANY"
MAINT = "PRUNE1"
MAINT = "PRUNE2"
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STREET:	ADDR_NO:	TREE_CELL:	COMM_NAME:	OBS_CAT	OBSERVED	SITE_ID:
NEW YORK AV	3200	5	PLUM	MAINT	PRUNE2	2804
NEW YORK AV	3600	8	ELM, LACEBARK	MAINT	PRUNE2	2690
PARK ROW DR	1200	3	PINE, SLASH	MAINT	PRUNE2	4607
PARK ROW DR	1200	6	PINE, SLASH	MAINT	PRUNE2	4610
PARK ROW DR	1200	7	PINE, SLASH	MAINT	PRUNE2	4611
PARK ROW DR	1200	9	PINE, LOBLOLLY	MAINT	PRUNE2	4613
PARK ROW DR	1200	11	PINE, SLASH	MAINT	PRUNE2	4615
PARKWOOD AV	100	12	PECAN	MAINT	PRUNE2	1709
PIONEER PW	800	28	SOPHORA, TEXAS	MAINT	PRUNE2	4152
RANDOL MILL RD	2800	4	OAK, LIVE	MAINT	PRUNE2	1372
RANDOL MILL RD	3100	1	OAK, LIVE	MAINT	PRUNE2	1380
RANDOL MILL RD	3100	6	OAK, LIVE	MAINT	PRUNE2	1385
RANDOL MILL RD	3100	7	OAK, LIVE	MAINT	PRUNE2	1386
RANDOL MILL RD	3100	9	OAK, LIVE	MAINT	PRUNE2	1388
STATE HWY	100	28	PINE, AFGHAN	MAINT	PRUNE2	1108
STATE HWY	100	57	REDBUD,	MAINT	PRUNE2	1137

Totals = 120

Appendix D: Suggested Tree List

Other species to consider planting on Arlington's medians and streets

LARGE MATURE SIZE TREES

Common Name	Botanical Name	Tree Type	Moisture Requirements
Live Oak	*Quercus virginiana*	Leaved Evergreen	Dry
Western Redcedar	*Thuja plicata*	Conifer	Moderate
Chinese Elm	*Ulmus parvifolia*	Deciduous	Moist to Dry
Bald Cypress	*Taxodium distichum*	Conifer	Moist (when immature)

MEDIUM MATURE SIZE TREES

Common Name	Botanical Name	Tree Type	Moisture Requirements
Arizona Cypress	*Cupressus arizonica*	Conifer	Dry
Lacey Oak	*Quercus glaucoides*	Deciduous	Dry
Western Soapberry	*Sapindus drummondii*	Deciduous	Moderate to Dry
Bigtooth Maple	*Acer grandidentatum*	Deciduous	Moderate
Carolina Laurelcherry	*Prunus caroliniana*	Leaved Evergreen	Moist

SMALL MATURE SIZE TREES

Common Name	Botanical Name	Tree Type	Moisture Requirements
Crepemyrtle	*Lagerstoemia indica*	Deciduous	Dry
Desert Willow	*Chilopsis linearis*	Deciduous	Dry
Mesquite	*Prosopis glandulosa*	Deciduous	Dry
Texas Buckeye	*Aesculus arguta*	Deciduous	Dry
Texas Mountain-Laurel	*Sophora secundiflora*	Leaved Evergreen	Dry
Texas Persimmon	*Diospyros texana*	Deciduous	Dry
Carolina Buckthorn	*Rhamnus caroliniana*	Deciduous	Moderate to Moist